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Carbon Capture and Storage: legal issues

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Carbon dioxide Capture and Storage (CCS) describes the process of capturing CO2 emissions from industrial and energy-related processes, compressing the gas to a liquid form, transporting it to a storage site (by pipeline, ship, truck or rail), and injecting it into a geological cavity – to isolate it from the atmosphere.

CCS has been described as one option in the 'portfolio' of mitigation options - useful as a bridging technology to address the most prevalent greenhouse gases by volume in the short term, while economies make the shift from fossil fuels to low-carbon energy sources, including renewables. The IPCC has estimated that CCS has the potential to contribute 15-55% of the cumulative mitigation effort worldwide until 2100. However, for this to occur, the IPCC estimates that several hundreds or thousands of CO2 capture systems would need to be installed over the next century.

Such a prospect raises a host of legal and regulatory issues and concerns. CCS activities will have to be undertaken in a manner consistent with the range of existing regulatory frameworks developed at the national level to address environmental and health and safety risks. But consistency with international law will also be essential where transboundary impacts are possible, transboundary transportation is involved, or offshore storage activities are contemplated.

Environmental Risks

Under international law principles, States have the sovereign right to exploit their own resources. At the same time, they also have the responsibility to ensure that actions taken within their jurisdiction or control do not cause damage to the environment of other countries, or to territory beyond the limits of their national jurisdiction.

Proponents of CCS argue that its implementation will prevent a portion of the global warming and ocean acidification that would otherwise result from allowing captured CO2 to escape into the atmosphere.

Others caution that expensive investments in CCS end-of-pipe technologies may merely entrench coal and fossil-fuel dependency, and the same funds might be better spent on renewables. Moreover, CCS itself may present significant environmental risks that warrant careful consideration. A sudden, large release of CO2 from a pipeline or storage site could endanger human life in populated areas through asphyxiation, as CO2 is heavier than air.due Gradual leakage of stored CO2 may occur from geological storage sites through faults, fractures or wells; elevated CO2 levels in surrounding areas could have lethal effects on plants and subsoil animals, or contaminate groundwater. Pressure build-up caused by CO2 injection could cause small seismic events. An increase of CO2 concentrations through leakage into the marine environment could increase acidity, killing ocean organisms and impacting dependent ecosystems.

International Law Frameworks

The UN Framework Convention on Climate Change (UNFCCC) and its Kyoto Protocol are two international legal frameworks that are clearly relevant to large-scale CCS activities. However, many other international law frameworks are also relevant. These include those designed to address air pollution, water pollution, marine pollution, waste management and transport, land and marine transportation of dangerous substances, natural resource protection, environmental impact assessments, site ownership and control, permitting and licensing, public information and awareness, and access to environmental justice. Although these frameworks were not drafted with CCS in mind, many contain definitions and prohibitions that are sufficiently broad to encompass certain CCS activities. Examples of defined terms within these agreements include 'pollution', 'land-based pollution', 'wastes', 'hazardous wastes', 'industrial wastes', 'liquid wastes', 'harmful substances', 'dangerous substances', 'dangerous activities', 'dumping', 'disposal' and 'storage.'

KEY MESSAGES:

- **International conventions and regional agreements currently prohibit some proposed forms of geological storage**
- **Both developed and developing countries lack regulatory frameworks for geological storage**
- **International standards for site selection, monitoring, and accounting are needed**
- **Developing countries may additionally lack regulatory frameworks for capture and transport, including environmental, health and safety regulations**
- **Legal frameworks have not yet been developed to address long-term liability issues for stored CO2, or for the impacts of leakage from geological storage sites to the global atmosphere**

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Where it is not clear whether a CCS activity falls within or outside the scope of an existing defined term and/or framework, clarification may be needed to provide industry with regulatory certainty.

Those interested in engaging in geological storage in offshore areas have already highlighted areas of concern within the marine pollution conventions that regulate their activities. For example, the **London Convention** is a global agreement that prohibits the dumping 'at sea' of 'industrial wastes', defined to include 'waste materials generated by manufacturing or processing operations'. Captured CO2 from industrial processes, intended for disposal, would seem to fall within this definition. The **London Protocol**, which entered into force this year, replaces the London Convention for its Parties.The Protocol prohibits the deliberate disposal into the 'sea' of all wastes or other matter from vessels, aircraft, platforms or other man-made structures at sea, although certain listed wastes or other matter 'may be considered' for dumping. 'Sea' is defined more specifically than in the Convention, to include the 'seabed and subsoil'. As a result, geologic storage by injection from vessels or manmade platforms at sea directly into sub-seabed repositories has been prohibited. In November 2006, an amendment proposed by a number of countries was adopted by the Contracting Parties, adding 'CO2 streams from CO2 capture processes' to the list of wastes and other matter that 'may be considered' for dumping under the Protocol. This in turn raises additional issues – such as the purity required of dumped CO2 streams. The Parties have agreed that CO2 may only be considered if it consists 'overwhelmingly' of CO2' - but 'overwhelmingly' is left undefined.

The OSPAR Convention regulates the deliberate dumping of pollutants into the North-East Atlantic Ocean maritime area. It uses different approaches for pollution from land-based sources, pollution by dumping, and pollution from off-shore sources – oil and gas activities. These annexes create the potential for different treatment of CO2 injection into geological storage sites reached by pipeline from land, by vessels, by manmade structures at sea that are not related to oil and gas extraction, and offshore installations that are related to oil and gas extraction. Many other regional seas agreements are in place around the globe with similar definitions and provisions.

However, even where frameworks ***are*** specifically intended to address the challenge of CO2 emissions, a variety of difficult legal issues arise. For example, the **UNFCCC** requires a compilation of a national inventory of 'emissions by sources' and 'removals by sinks' of all greenhouse gases, using comparable methodologies agreed by the Parties. This has raised the question of whether captured emissions are in fact 'emissions' or whether storage sites are 'sinks'. The IPCC has now provided draft guidelines for reporting captured CO2. But nevertheless a sound policy justification will have to be made if the avoidance of emissions to the atmosphere through long-term geological storage is to be treated as equivalent to emissions reduction at the source. This is particularly true if CCS projects are to be considered for inclusion within the **Kyoto Protocol's** Clean Development Mechanism (CDM). Each tonne of CO2 for which a certified emissions reduction (CER) is issued from a CDM project undertaken in a developing country permits the generation of a corresponding tonne of emissions in an industrialized country operating under a Kyoto cap on emissions. Moreover, CDM projects are intended to contribute to sustainable development in the host country. According to the IPCC, a plant using CCS technology requires roughly 10-40% more energy than a plant without CCS. Any crediting system will have to take this 'energy penalty' into consideration, and consider whether a technology that increases dependence on fossil fuels, and generates additional GHGs, is consistent with sustainable development. It will also have to carefully consider how to address crediting in the context of uncertain leakage rates from storage sites that combine CO2 from a variety of installations or for a variety of purposes (e.g. disposal, enhanced oil recovery) and sites that extend beyond national boundaries.

At the regional level, many other legal frameworks warrant review in the context of large-scale CCS activities. For example, the **EU Waste Framework Directive** contains a definition of 'waste' that excludes from its scope only 'gaseous effluents emitted into the atmosphere.' However, CO2 that is not 'emitted into the atmosphere' but instead captured prior to emission, and intended for disposal, would seem to fall within the Directive's regulatory scope as 'waste'. **The EU Landfill Directive** in turn imposes a total ban on the acceptance of liquid waste at landfills, and CO2 is most likely to be injected into geological cavities in liquid form. The **EU Water Framework Directive** allows EU Member States to authorise the injection of certain substances resulting from oil and gas exploration and extraction back into the geological formations from which these substances have been extracted, or into geological formations that are unsuitable for other purposes, or for storage in certain circumstances. But no explicit reference is made to CO2. The **EU Environmental Liability Directive** places strict liability on 'operators' for the prevention and remediation of environmental damage to protected species, natural habitats, water or land resulting from a range of listed 'occupational activities', which may include certain CCS activities. But the Directive does not address damage to the atmosphere resulting from leakage of CO2 from geological storage sites, or liability for releases that impact upon commitments under the **EU Emissions Allowance Trading Directive.**

The above examples highlight just a few of the many issues raised by CCS, even in regions and jurisdictions that have comprehensive regulatory frameworks already in place. Ironically, it is the very lack of detailed regulatory frameworks for environmental, health and safety risks that may enable CCS to proceed apace in developing countries.

Conclusion

Existing legal frameworks may preclude certain CCS activities or cast doubt on their legality. Efforts are underway to clarify the applicability of individual regimes to CCS activities (e.g, under the London Protocol). However, much remains to be done to create a clear regulatory framework for CCS. Key elements that are needed include: criteria for site selection; criteria for environmental impact assessments; monitoring systems; verification systems; a clear allocation of responsibility for stored CO2; and a long-term liability regime to address both the global impacts of released CO2 and the release of CO2 for which credit has been previously awarded under emissions trading schemes.

Sources
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